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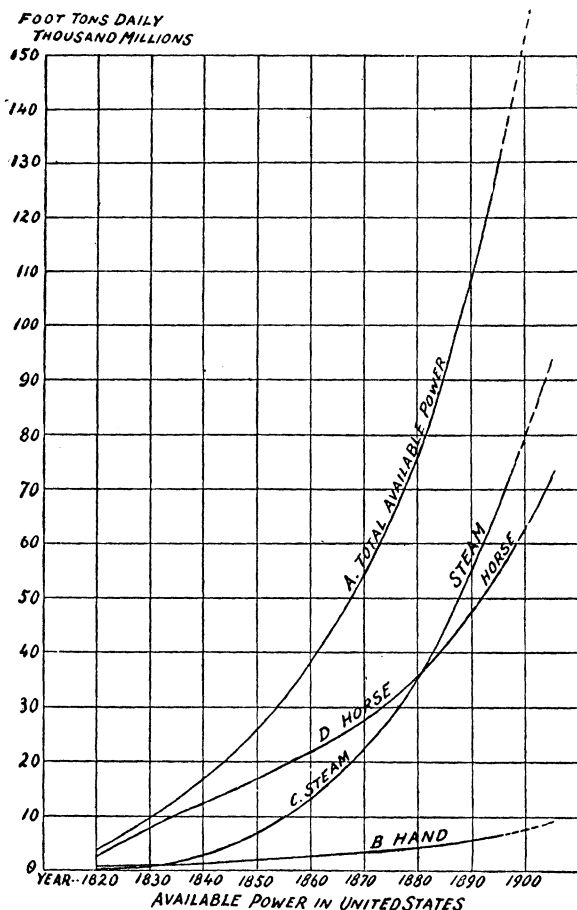
TREND OF NATIONAL PROGRESS.

BY ROBERT H. THURSTON, DIRECTOR OF SIBLEY COLLEGE,
CORNELL UNIVERSITY.

GREAT movements, whether of mind or matter, of nations or of planets, of civilizations or of comets, of philosophy, of religion, or of wealth-production, are the results of the action of great natural forces, and have, in all cases, a definable route and rate of motion. As the writer has often put it: "Nature never turns a sharp corner" in any such movement, and the mighty flux of material and of intellectual forces, and the grand resultant flow of the current of material, or of intangible progress, must always be as steady and as smooth as that of a great river flowing through a plain. It may deviate, and even turn upon itself at times, but it must have a smooth curve, if not a rectilinear course. Now and then some great moral or physical obstruction may impede or divert its stream, but only mighty forces, commensurate with the tremendous inertia of the mass affected, can produce immediate or marked effects upon either its magnitude or its direction.

It thus comes that, if we can trace the line of progress during the immediate past,—if we are able to follow it during past centuries or bygone ages,—we may lay down upon the chart the line of its earlier course, to date, and can see at once what must, inevitably, be the direction, the rate, and the distance gained, in any stated time in the immediate future, *provided* new and catastrophic phenomena do not, by their unexpected and unforeseeable action, invalidate all prophecy. Given the curve of human progress, in any field, as representing the immediate past, the immediate future becomes knowable with a degree of accuracy and certainty, which is the greater as the forces and the masses affected by them are the greater. The terminal portion of our curve exhibits the tendency, and the direction of movement, at the

moment; and if no great physical or moral force threatens to introduce a new deviating power, or to cause some catastrophe, the progress of to-day will be, inevitably, the outcome of the progress of yesterday and the introduction to the progress of to-



(FIGURE 1.)

morrow, with unchanged, or little changed, rectilinear or curvilinear advance. The rate of progress of education, or of wealth-accumulation, in 1895, must be substantially correct as a gauge of that of 1896, or with, perhaps, a little less exactness, of that of 1900. A great war, or a world-wide commercial depression,

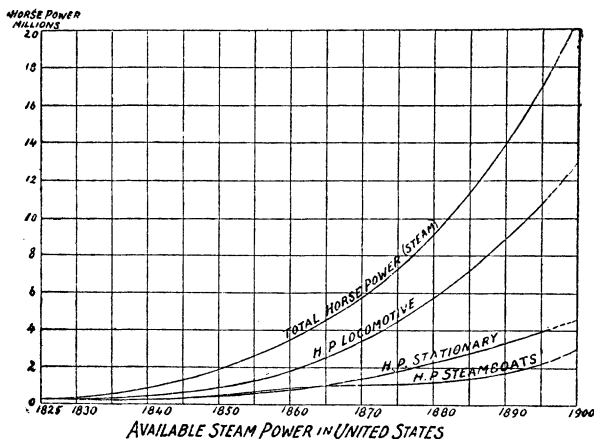
or a "reformation," may now and then, in the course of the centuries, affect these great social currents of progress; but, if nothing at the moment looms up, threatening the immediate future, the trend of human or of national progress may be considered as fully established.

The distinguished statistician, Mr. Mulhall, in a recent issue of the NORTH AMERICAN REVIEW, has given the data which permit the establishment of the curves of progress of the nation, from early in the century to date, and thus their approximate establishment in location, form, and direction, for the immediate future. No great war occurring, and no serious catastrophe of other kind taking place, we may obtain an idea of the probable future movement, in its extent and direction, and in results; the accuracy of which will be more or less certain accordingly as the curve, so far as laid down from our data, is more or less smooth and even and persistent in its line. The tendencies of the moment are within the view of the student, and the immediate future comes into the field of view of the clairvoyant scholar.

Taking up this mass of most interesting and instructive data, let us construct our curves and observe what they represent and to what they point; and let us see what we can discover of the trend of national progress in growth, in wealth, in knowledge, and in power.

The basis of all wealth and the measure of the power of accumulation of wealth is the aggregate working power of a people. The working power of a civilized people has come to be measured by the total of its steam power. The growth in its total "horse power" in *steam engines* of all kinds is the measure of its growth in all the material foundation of civilization and progress, and thus material progress underlies progress in all the arts and sciences, and every intellectual as well as material advance. The first of our diagrams (Figure 1, *A*) exhibits the trend of our progress in developing power of national advancement. Its smooth, steady curvature shows not only advance and constant gain, but a steady and continuous *gain in rate of gain*. A straight line would simulate gain by simple interest; our curves, *A* to *D*, simulate gain by compound interest with frequently recurring periods of payment. The century has seen great gain in power of doing work, of accumulating wealth, and great *gain in rapidity of gain* of power and wealth. All our

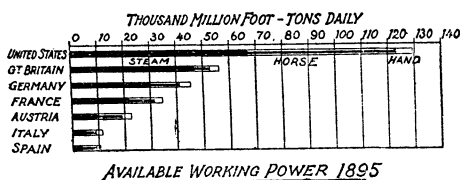
subsequent deductions confirm this primary and essential, this fundamental, conclusion. The United States of North America constitutes not only the most powerful of nations, in the most literal and meaning sense, but it is all the time increasing its speed in the race and as constantly more and more rapidly distancing its competitors. As we shall see presently, its greater and growing intelligence, its great inventive power, fostered by our exceptionally effective patent system; its industry, its education; its conscientious acceptance of the correct principles of morals and of economics, as they are brought forward and generally discussed—all these, and other and concomitant qualities, give good reason for Mulhall's closing and enthusiastic prediction, as well as for all the eloquence and pride and confidence of Carnegie.



(FIGURE 2.)

In Figure 1, the line *A* is the expression of the fact and the law of our progress from 1820 to 1895; and the dotted portion shows clearly what is to be anticipated in the immediate future, if no catastrophic and unanticipated change in the conditions determining the fact and the law occurs. The smoothness of the curve and its regularity of curvature prove that natural causes have operated very steadily and continuously, in spite of occasional "crises," and that we may fairly assume the continuation of the curve in the same geometric relations to give us a prophecy of the coming years. Our total physical power for use in driving machinery, for wealth production, has risen from about 4,300,000,000 foot-tons, daily, in 1820—the equivalent of lifting a ton

800,000 miles—to nearly ten times that figure in 1860, and to thirty times that power in 1895. It is seen that it must become something like forty times as much, about 150,000,000,000, in 1900. Human power is seen to be growing slowly, *i. e.*, in proportion to population, simply; while steam-power, coming in with Watt's perfection of the engine, at the beginning of the century, will amount to one-half the total this year, and aggregate 80,000,000 in 1900, and 110,000,000,000 in 1910. Horse-power, steadily growing at a moderate rate, though much faster than population, in the earlier half-century, and greater by far than steam-power, finally is eclipsed about 1880 by the latter, and, though still rapidly and steadily growing, falls far behind at the end of the century. Steam-power measures most accurately, probably, the ability to accumulate all those comforts and luxuries which constitute modern civilization, and it is seen that the trend of the line is there most rapidly upward. A glance at the



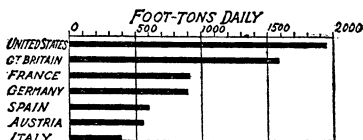
(FIGURE 3.)

succeeding diagrams will show the details of this progress and confirm our first and fundamental deduction.

Figure 2 simply classifies the forms of steam power into marine, stationary, locomotive, and gives their aggregate. The mightiest gain is seen to be in locomotive engines on our railroads. These curves show not only what are the figures for the past and the present, and for the next few years; but their uniformly steady curvature proves that we may fairly anticipate their continuation, with the same steady smooth sweep, for a quarter or a half century to come, should no catastrophe or revolutionizing invention break up our industrial methods and radically change social conditions. The horse-power of all steam engines to date has come to be about 17,000,000, will be nearly 25,000,000 in 1900, and double that figure in another quarter-century. The striking fact, here, is the proportion in which transportation demands power, as shown by the sum of the

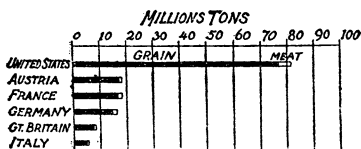
figures for railroads and steamboats. The curve for stationary engines exhibits the proportion devoted to manufacturing the articles transported. In every case the trend of progress is onward and upward, and with an accelerating velocity.

The next cluster of diagrams illustrates present momentary relations, as to numerical and comparative quantity, of the principal nations, as obtained by laying down Mulhall's data. Figure 3 places side by side the figures for available power of wealth-production, and we find the United States leading all nations



TOTAL AVAILABLE WORKING POWER, PER INHABITANT, 1895
(FIGURE 4.)

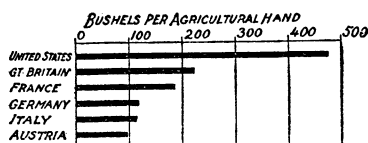
and doubling the amount assigned even to the leader among European countries, Great Britain. Germany is third, France fourth, and the other nations fall far behind. Reducing these figures to the measure of the working power per inhabitant, as in Figure 4, however, we get a more correct basis of comparison, as a gauge of the character of the nation and its civilization. Here we find that the United States is still in the van; but Great Britain is a close second and the inhabitant of France or Ger-



AGRICULTURAL PRODUCTION, 1890.
(FIGURE 5.)

many has but about one-half as much power of wealth-production as the inhabitant of the United States. Figures 5 and 6 throw some light upon the national habits, policies, and capacities. They show the agricultural production of these nations. The United States not only produces enormously more grain, and other products, than either of the other great nations, but, what is vastly more important, interesting, and instructive, twice as much

per worker as even Great Britain. This is at once proof of the ingenuity of our people, in making the natural powers and all machinery do their work, of the value and marvellous helpfulness of our patent system, and of the ability of our people to make their work tell most effectively in the application of wealth-producing powers to the production of the *permanent* forms of wealth, where other nations are compelled to devote their energies more largely to the production of the perishable articles—food, for example. That nation which can turn its power, mainly, into the

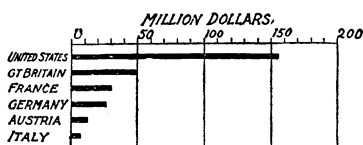


PRODUCTION OF GRAIN PER HAND 1890
 ASSUMING 10 LBS. OF MEAT OR 2 GALLS OF WINE
 EQUIVALENT TO ONE BUSHEL OF GRAIN.

(FIGURE 6.)

production of the former kinds of wealth obviously will, other things equal, accumulate wealth and promote the comfort and content of its citizens most rapidly.

Figures 7 and 8 are even more interesting to the economist and to the statesman. The appropriation of public funds to educational purposes is seen to be about three times as much in

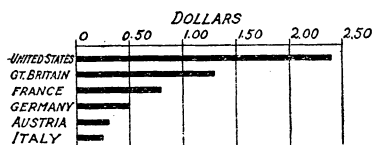


EDUCATIONAL EXPENDITURE PER ANNUM

(FIGURE 7.)

the United States as even in Great Britain, and five times as much as in France and Germany, ten times as much as in Austria. The expenditure *per capita* is nearly double that of Great Britain, three and five times that, respectively, of France and Germany, and ten times that of Italy. These figures may perhaps be taken as the natural resultant of the preceding or, rather, these figures, representative of the intelligence of the country, in close degree, together with the freedom of the nation, and its inventiveness, stimulated by both freedom and a good system of patent law, are

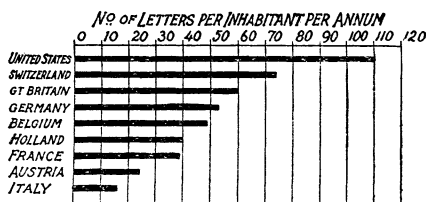
the basis of the wonderful gains already illustrated. Figure 9 shows the number of letters sent, per inhabitant, in each country, and measures the intelligence of its people. Figure 10 exhibits



EDUCATIONAL EXPENDITURE PER INHABITANT PER ANNUM

(FIGURE 8.)

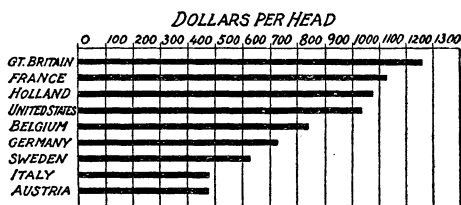
the wealth *per capita*, the natural and inevitable consequence of that ratio of intelligence with this marked qualification—the wealth of the United States is the accumulation of a single cen-



POST OFFICE RETURNS

(FIGURE 9.)

tury; that of Great Britain comes of intelligently directed energies, in commerce and manufactures, for centuries, and the other European countries have the same advantage—in respect to time,



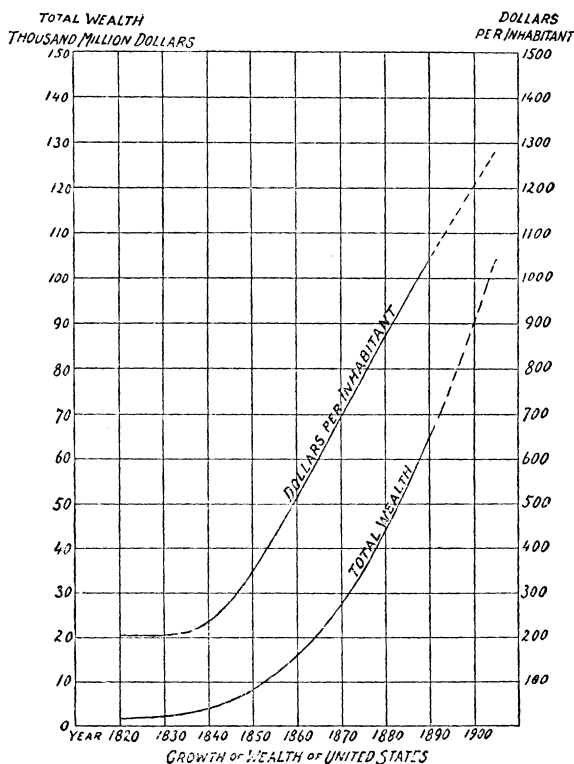
AVERAGE OF WEALTH TO POPULATION

(FIGURE 10.)

only. Accumulations of centuries place three European nations ahead of the United States in this aggregate; but the gains are most rapid with our own country, and we shall soon take the lead.

Our public school system and the coming universality of the pol-

icy, on the part of the States, of taking charge of and liberally supporting higher education, as in the State universities and the possibly soon-to-be-founded National University, gives this country much of this extraordinary advantage and goes far toward making it the leader of the world in growth, in wealth, both material and intellectual. The trend of our progress is constantly onward and continually at such a rate of movement and of acceleration

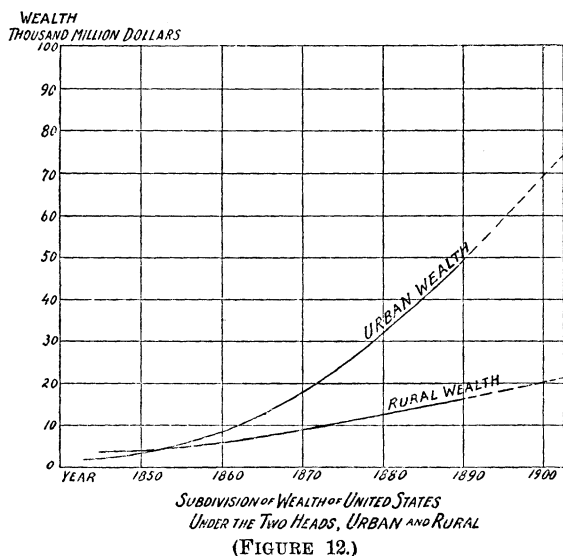


(FIGURE 11.)

as well, as must steadily increase our relative and our actual altitude.

Figure 11 exhibits this growth of wealth, in the United States, as the product of the inconceivable physical power applied by our people to its production. The lower curve, and the lower and left-hand scales, illustrate the total wealth of the nation, and its growth from the beginning of the century, while the dotted lines,

as before, indicate the future probable growth. From 1820 or 1830, wealth has been rapidly increasing with an accelerated ratio. That is to say, from the date of the perfection of Watt's steam engine and its application to mills and factories, and to steamboats and railroads, wealth has accumulated with a continually increasing *rate* of accumulation. From 2,000,000,000 in 1820, it has come to be 65,000,000,000 in 1890, and may be expected to become fifty per cent. more in 1900, and to double in the next quarter of a century. But the upper curve, of which

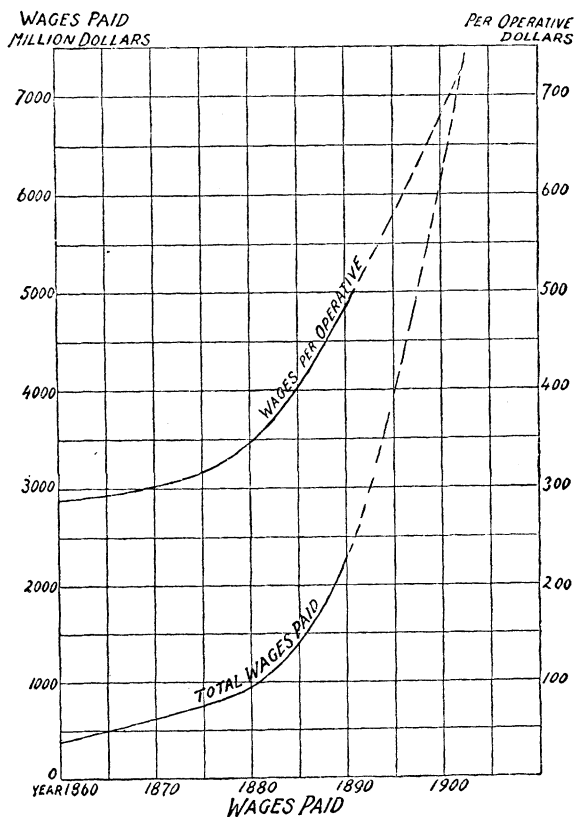


the quantities are reduced to dollars *per capita*, is a better index of our progress and its trend. The right-hand scale applies here.

The wealth, per inhabitant, was but \$200 *per capita* in 1820; it was \$1,000 in 1890, is now \$1,120, and will be \$1,200 in 1900.

The smooth and steady curvature of the line indicates that we may expect this gain to continue, indefinitely, into the coming decades at least, and that, with wise administration of the government, with repression of economic heresies and follies, and with continued industry and growing intelligence as the outcome of more and more general and complete education, our people may anticipate a total wealth of \$2,000 for every man, woman and child in the community, within the first quarter of the new century. When it is remembered that this people to-day enjoys

all the comforts, and many of the luxuries, of our fathers' generation, and that nearly all the coming gains of working power and in production will be applied to the securing of still greater comfort and of still more general distribution of luxuries, it can be seen very clearly that only their own follies can probably prevent this people from enjoying such a life as only poets have hitherto dreamed of, and that within the next one or two generations



(FIGURE 13.)

at latest. Our grandchildren will see this coming of a millennial period—lacking, perhaps, only the moral element so far as our people choose to forego that most essential of all its elements. In material comfort and prosperity the addition of a thousand dollars' worth of comfort and of luxury to every household, for

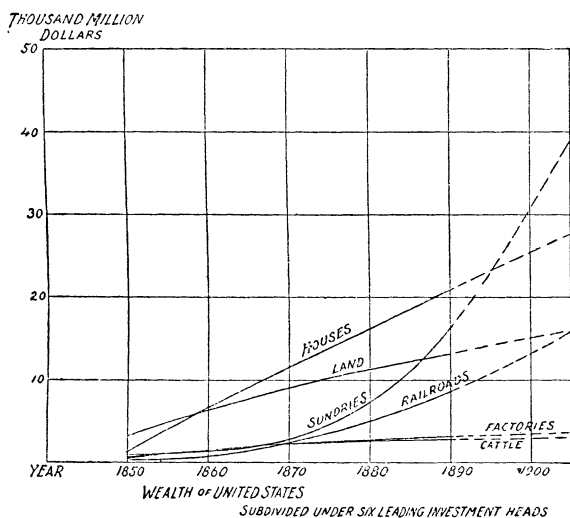
each one of its members, should give marvellous improvement in an even now marvellously fortunate country.

Figure 12 shows how this wealth is, and is to be, distributed. It was mainly rural in the early days of the century; it was equally divided between city and country in 1855, and it is to-day three-fourths urban. This means that both people and property are accumulating in the cities, a fact long since recognized by every statistician. It means further, that the country is supplying the city with its surplus population, and that the city is paying that surplus better wages than can be paid in the country. It means, again, that the attractions of city life are steadily becoming more seductive, and that the coming ideal life of the every-day citizen is a city, and not a country, life. In 1900 the cities will contain between three and four times as much wealth as the country. This surplus of wealth will be devoted to the construction of attractive homes, to the sanitary improvement of the towns, to the provision of educational and other intellectual advantages that, in the aggregate, must make the city more and more attractive, in a thousand ways. The tendency is, in many ways, unfortunate; but it is certain and we must make the most and the best of it. A distinguished engineer, in a lecture recently given to the young men of his profession at Cornell University, suggested that, after all, with the coming improvements in sanitation and education in cities, it may prove that the vision of the prophet, of a heavenly city, may not be altogether unjustified, and the coming earthly paradise, like the heavenly one, may prove to be urban.

Figure 13 shows how wages are and will be distributed out of this wealth production. Before 1860 the wages were what we should to-day think very low; but, since the institution of the embargo by the civil war, and the partial embargo of the late war-tariff, all wages have been steadily and rapidly climbing, with that same acceleration of rate of gain which has been everywhere else observed. Almost five times as much is paid out as wages, each year, as is measured off as the total capital of the country at the time.

But the striking and encouraging fact is exhibited in the lower of these two curves. The wages paid each operative, less than \$300 in 1860, is nearly \$600 to-day, and will be above \$600 per annum in 1900, if nothing occurs to disturb our present pros-

perity and the conditions of progress. In a few years more, the wages paid, on the average, per individual worker, will be as great as to-day supports the average well-to-do family. Of all our curves, this is one of the most rapid in its rise, and this means that the distribution of wealth is continually coming to be more and more equalized, and that the average day laborer, and the workman of every grade, will continually profit more and more, and will gain constantly a larger and a larger share of this distribution. Wealth will be more and more equally distributed, just as long as present social and economic conditions are maintained in a wholesome and uncrippled state. The



(FIGURE 14.)

working people of the United States are rapidly taking possession of its wealth, as they always have held possession of its policy and of its legislation. In fact, while we may boast many millionaires, as we boast of an occasional giant stalk of corn or tall wheat-straw, it is the people as a whole, and the average working citizens, of whom we must think as the makers of the nation and the creators of its wealth. It is the average citizen, no less, who possesses that wealth and who directs the progress of the nation.

The point made at the beginning of this article—that future

gains of power and wealth will take the direction of improving the condition of the people directly, by giving more universal distribution of comfort and of luxuries, is well illustrated in the next diagram. Figure 14 shows the divisions of wealth, as classified by Mulhall, into a half dozen principal forms of investment. Wealth in cattle and herds grows slowly, as our facilities for transportation bring into the market a widening area of meat-producing country, and the markets of the world are supplied from Texas, from South America and Australia, prices are thus held down, and the people are able to buy their meat at low relative cost. Factories represent the next largest investment. But here improvements in the arts are continually making each more productive, and also making their erection and operation cheaper and more fruitful, relatively; so that while we are producing enormously more extensively than formerly, it is with relatively slow increase in the amount of our funds so invested. Railroads follow the general course of the curves already presented as those of steam power. They will, in 1900 or a little later, have the full value of all the lands of the nation.

But the curves for houses and for "sundries" are the most striking, when interpreted. The growth in value of real property is seen to be very steady and uniform. This fact, taken in conjunction with the known decrease of costs of construction, shows how steadily and how rapidly the people are coming to possess comfortable homes and permanent residences. This is the foundation of all the material good in life.

It is the curve of "Sundries" that most of all interests us. This includes all the thousand and one articles of comfort and luxury which make the life of the people worth living. It is in the production of a higher and steeper curve that our growing power is largely applied. It is this curve which best shows the trend of our modern progress in all material civilization. Our mills, our factories, our workshops of every kind are mainly engaged in supplying our people with the comforts and the luxuries of modern life, and in converting crudeness and barbarism into cultured civilization. Measured by this gauge, we are fifty per cent. more comfortable than in 1880, sixteen times as comfortable as were our parents in 1850, and our children, in 1900 to 1910, will have twice as many luxuries and live twice as easy and comfortable lives, if they choose so to do, as do we to-day.

Some important conclusions are easily and very positively deducible from the study of these curves and diagrams. Thus :

(1). It is evident that great social and economic laws are in steady, unintermitted operation, covering with broad sweep, industrially as well as chronologically, the trend of modern progress, and controlling the development, in wealth, education, and all material and intellectual lines, of every civilized nation.

(2). These laws insure steady progress, for decades, probably for centuries, and with steady acceleration, as well, and without much regard to "crises," or to what are called good and bad times.

(3). The trend of progress during past decades, and its direction and acceleration at the moment, constitute the best guide in predicting a probable future for our industrial and social system.

(4). This guide indicates a constant gain in rate of progress, as well as in actual accumulation of wealth, in all industrial products, in intellectual capital, and in general improvement.

(5). A point has been reached at which the already enormous, and now rapidly growing, physical power of the world is being mainly directed, in civilized countries, and especially in the United States of North America, to the supply of comforts and luxuries to a people already, on the average, well cared for and insured against suffering and hardship.

(6). Very soon, and probably within another generation, the average citizen will possess comforts and luxuries, and enjoy the advantages of leisure for thought and study and intellectual growth, which are, to-day, the sole possession of those who are distinctively denominated rich. The nation may be expected to become a country of large and well-distributed wealth, and of, on the whole, well-to-do and contented people.

(7). The direct means and methods of progress are through the continual improvement of the arts and sciences, and the steady reduction of the proportion of working power applied to the manufacture of the more perishable forms of wealth, and through the steady gain in the productiveness of that power as a result of improvements in modern machinery and of the introduction of new inventions.

(8). Culture, and all that makes life worth living, will come to the nation, in constantly and rapidly increasing proportion, as

the progress indicated by our diagrams, and by the smooth sweep of our curves, continues.

(9). Our own nation, through its free institutions, its wise encouragement of the arts and sciences and of invention, already leads, and will lead in still greater and greater degree as time goes on, through the immediate future, and until economic laws—or the follies of social leaders—break the curve which exhibits “The Trend of Modern Progress.” Science thus reads us an oracle.

The scientific principle which this article further illustrates is that of a truly logical and scientific form of prophecy. Science, and science only, often can, and frequently does, by a perfectly accurate and correct method, give us clairvoyant views of the immediate, if not often of the remote, future. Of the Trend of Modern Progress, in direction and rate of movement, there is no reasonable doubt.

R. H. THURSTON.